

**UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

SINGULAR COMPUTING LLC,

Plaintiff,

v.

GOOGLE LLC,

Defendant.

Civil Action No. 1:19-cv-12551 FDS

DECLARATION OF MARTIN WALKER, PH.D.

I. INTRODUCTION

1. I am an engineer with nearly 40 years in writing, design, and testing software. I also have over 15 years of experience in analyzing or reverse engineering software. I have also been a consultant on technology issues, including in litigation, since 2001. Since that time, I have served as an expert in nearly 100 cases for both plaintiffs and defendants. I have also been engaged by a court as a “technology neutral” to assist in the resolution and adjudication of electronic discovery issues.

2. I have been asked by counsel for Google LLC to render an opinion with respect to certain files produced by Singular Computing LLC (“Singular”) in the case *Singular Computing LLC v. Google LLC*, No. 19-cv-12551 (D. Mass.) (“the Litigation”).

3. I am being compensated at the rate of \$515 per hour for preparation of expert reports, research, and related tasks, and deposition testimony in the Litigation. My compensation is not contingent on any ruling or outcome in the Litigation.

4. In arriving at my opinions, I have relied on my education, training, and experience from nearly 40 years as a computer and electrical engineer, including substantial work with hardware design, firmware, and software. The opinions presented in this declaration are my own and, to the best of my ability, are true and correct. If asked to do so, I would be willing to testify regarding my opinions in this declaration.

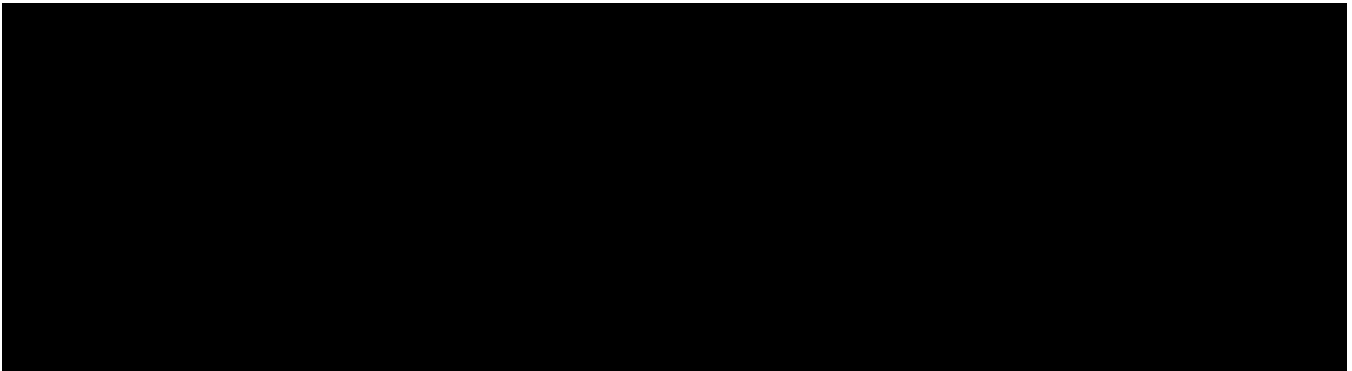
II. MATERIALS REVIEWED AND CONSIDERED

5. I have reviewed the source code file produced by Singular with the page numbers SINGULAR-0012094 through SINGULAR-00012100. I understand from counsel that Singular has represented that this file contains the source code for the program that Singular used to run the tests referred to in the First Amended Complaint (“FAC”). I will refer to this source code file

as the “FAC Testing Source Code.” I have also reviewed the source code file produced by Singular with the page numbers SINGULAR-00006379 through SINGULAR-00006385. I understand from counsel that Singular has represented that this file contains the source code used to run the tests underlying Singular’s infringement contentions. I will refer to this source code file as the “Contentions Testing Source Code.”

Source code referred to as:	Source code produced as:
FAC Testing Source Code	SINGULAR-0012094 through SINGULAR-00012100
Contentions Testing Source Code	SINGULAR-00006379 through SINGULAR-00006385

6. I have also reviewed the files produced by Singular in the page range SINGULAR-00012101 through SINGULAR-00012518. These files appear to contain the outputs produced by a computer program that multiplies numbers and analyzes the results, as shown in the excerpt below from SINGULAR-00012101. I will refer to these files as the “Test Result Files.”¹



III. SUMMARY OF OPINIONS

¹ Three of the files in this page range (Singular-00012454, -12457, and -12505) contain only a line starting with the word “[REDACTED].” It is not clear what this means, but these files are not relevant to my analysis.

7. In my opinion, the outputs shown in the Test Result Files were not produced by a computer program that was compiled from the FAC Testing Source Code, but were instead produced by a program that was compiled from the Contentions Testing Source Code. In addition, in my opinion, the outputs shown in the Test Result Files are not the outputs cited in the First Amended Complaint.

IV. QUALIFICATIONS

8. I attach as Exhibit A my *curriculum vitae*, which includes a complete list of my qualifications.

9. I received my Bachelor of Science degree in Electrical Engineering from the Massachusetts Institute of Technology in 1973. I then received my Master of Science and Doctor of Philosophy degrees in Electrical Engineering in 1976 and 1979 from Stanford University.

10. I have over 40 years of experience with writing and analyzing computer software.

11. Beginning in 1981, I developed computer software to aid in the development of integrated circuits. From 1983 to 1989, I was the founder and Chief Technical Officer at Analog Design Tools, Inc. Analog Design Tools' primary product was software used to design integrated circuits. I was responsible for all technical aspects of product definition and development, including the software design.

12. From 1990 to 1994, I was a founder and Executive Vice President of Symmetry Design Systems, which specialized in software product design and consulting for the electronic design marketplace.

13. In 1995, I founded a company called Frequency Technology (later Sequence Design) that develops software for the design of advanced system-on-a-chip integrated circuits.

As Chief Executive Office, director, and Chief Scientist at Sequence, I was involved in overseeing the development of the company's products and technologies.

14. In 2000, I became the Chief Technical Officer of Knowledge Networks, which was a market research company that leveraged internet technology to revolutionize the market research industry. I managed Knowledge Networks' engineering group, which designed web-based software for creating surveys, conducting interviews, and processing data.

15. Since 2001, I have been a consultant on various technology issues including software design and analysis. Since that time, I have served as an expert in nearly 100 cases. In addition, in 2006, I was appointed by The Hon. Jamie Jacobs-May of the Superior Court of California, Santa Clara County to resolve a dispute between litigants regarding electronic document production.

V. OPINION

16. The FAC Testing Source Code source code was provided to me by counsel as a PDF file with page numbers such as "SINGUAR-00012094," "SINGULAR-00012095," etc., as noted above. I am informed by counsel and understand that these page numbers were added by Singular as part of the document production process and are not part of the original text of the random test source code. The Contentions Testing Source Code was also provided to me as a PDF that included page numbers that I understand were added by Singular as part of the document production process.

17. Both the FAC Testing Source Code and the Contentions Testing Source Code are written in the C programming language, as is obvious to anyone familiar with C based on a review of the statements in those files.²

18. Source code written in the C language must be converted into an executable program by compiling the source code files using a program called a “compiler”; this executable program is what can then be run (executed) by a computer.

19. One well-known C compiler is a program called “gcc.” I understand from Counsel that Singular has represented that it used the gcc compiler to compile the FAC Testing Source Code. In particular, I understand that Singular represented that the command “[REDACTED]” was used to compile the source code. This command takes the FAC Testing Source Code, which is in a file [REDACTED]

20. For the purposes of my analysis in this declaration, I will refer to this executable program created by compiling the FAC Testing Source Code as the “FAC Testing Program,” and I will refer to the executable program created from compiling the Contentions Testing Source Code as the “Contentions Testing Program.” Because the FAC Testing Program is created by compiling the FAC Testing Source Code, I can analyze the behavior of the FAC Testing Program by reviewing the FAC Testing Source Code. Likewise, because the Contentions Testing Program is created by compiling the Contentions Testing Source Code, I can analyze the behavior of the Contentions Testing Program by reviewing the Contentions Testing Source Code.

² The Contentions Testing Source Code relies on extensions to C created by NVIDIA Corporation to enable executing parts of the code on certain versions of Nvidia’s graphics processing units (GPUs); for a technical introduction, *see* <https://docs.nvidia.com/cuda/cuda-c-programming-guide/index.html>

21. The FAC Testing Program [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

22. For the balance of this report, I will assume that when the FAC Testing Program is executed, [REDACTED]. Since the FAC Testing Program [REDACTED]

[REDACTED]




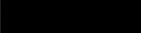
23. The FAC Testing Source Code [REDACTED]

[REDACTED]. Thus, by examining the references to the “[REDACTED]” function in the FAC Testing Source Code, I could determine what the FAC Testing Program might output.


24. The “printf” function can print plain text, special characters such as carriage returns and new lines, and the values of variables, using somewhat complicated formatting commands. However, the following explanations do not require a detailed understanding of these capabilities.


25. The section of the FAC Testing Code that contains [REDACTED]

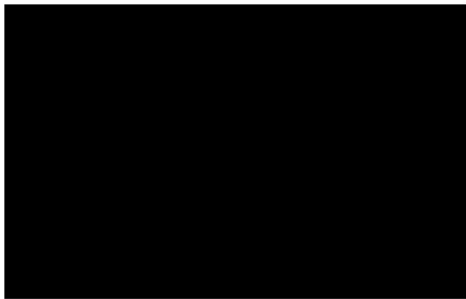
[REDACTED] I referred to in paragraph 21 above includes the reference to the “printf” function shown below from page SINGULAR-00012097. When the FAC Testing Program executes, it always executes this instance of the [REDACTED]” function:




This instance of the “” function writes as textual output the string that appears in quotes,   (It will not output the quotation marks themselves.) Thus, every time the FAC Testing Program executes the output from the program will include the text 


26. I have reviewed each of the Test Result Files. The text  does not appear in any of them. Therefore, in my opinion, the FAC Testing Program did not produce any of the outputs shown in the Test Result Files.³

27. Furthermore, all the Test Result Files contain the text , *e.g.*, as in this excerpt below from page SINGULAR-00012101:



28. The FAC Testing Program cannot produce the string A_BITS when executed. There is no instance of the “” function or any other function in the FAC Testing Source Code that outputs the text , and  does not appear as a literal string anywhere in the FAC Testing Source Code. Therefore, in my opinion, the FAC Testing Program did not produce any of the outputs shown in the Test Result Files, because those files all include the text

.

³ The FAC Testing Program also did not produce the three files I referred to in footnote 1 above, because there is no instance of any function in the FAC Testing Source Code that outputs the word “”.

29. To confirm that the FAC Testing Program produces the text [REDACTED], I used the same “gcc” compiler I referred to in paragraph 18 above to compile the FAC Testing Source Code on a Macintosh computer to create the FAC Testing Program.⁴

30. I then executed the FAC Testing Program using each of the [REDACTED] (see ¶ 21 above). The outputs from the six executions of the FAC Testing Program are attached as Exhibits C-H. As expected, the output of the FAC Testing Program included the text [REDACTED] and excluded the text [REDACTED] in all cases.

31. Unlike the FAC Testing Source Code, the Contentions Testing Source Code contains a “printf” statement that outputs the string [REDACTED] (see SINGULAR-00006383):

[REDACTED]

32. On the other hand, the Contentions Testing Source Code does not contain the string [REDACTED]

33. Thus, in my opinion, the Output Files containing the text “A_BITS” contain outputs that were produced by the Contentions Testing Program, not by the FAC Testing Program.

34. I also compared the test results shown in the Output Files with the test results cited in the First Amended Complaint (“FAC,” Dkt. No. 37). In paragraphs 94, 111, and 129, the FAC refers to “Singular test results shown below” and includes the following picture:

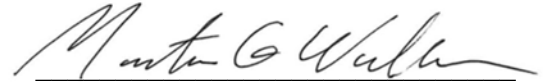
⁴ To compile the FAC Testing Source Code, I copied the text from the PDF file produced by Singular at pages SINGULAR-0012094 through SINGULAR-00012100 (except for the page number) into a text file and edited the file to fix certain formatting errors that arose from the way the text appeared in the PDF file. My corrected version of the FAC Testing Source Code is attached to my declaration as Exhibit B (the line numbers that appear on the left-hand side of Exhibit B were added by the text editor used to print the exhibit). I then named this file “mult.c” and compiled it on a Macintosh computer using the command “gcc -o mult mult.c”.

		bf16
% of valid > 1.00%		4.65%
% of valid > 0.50%		55.39%
% of valid > 0.20%		92.69%
% of valid > 0.10%		98.15%
% of valid > 0.05%		99.52%

35. This cited picture is not a picture of any text contained in the Test Result Files. The Test Result Files contain plain text, whereas the picture in the FAC appears to be a screenshot from a spreadsheet program such as Microsoft Excel. Furthermore, I have reviewed the Test Result Files, and none of the “Singular test results” referred to in the FAC appear in any of the Test Result Files. Thus, in my opinion, none of the outputs shown in the Test Result Files are the “Singular Test Results” cited in the FAC.

36. The picture cited in the FAC is also not a picture of an output that was created by either the FAC Testing Program or the Contentions Testing Program. The numbers in the picture cited in the FAC match numbers that can be produced by the FAC Testing Program when given one of the [REDACTED] (see ¶ 21 above). However, neither program can output the string “% of valid” based on an analysis of the references to the “[REDACTED]” function in those programs analogous to the analysis I conducted above related to the text [REDACTED] and [REDACTED]. Similarly, neither program can output the grid lines shown in the picture, since their outputs are pure text; moreover, neither program outputs textual formatting commands that some other program might translate to grid lines.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on April 25, 2021 at Woodside, California.

A handwritten signature in cursive script, appearing to read "Martin G. Walker", written in black ink.

Dr. Martin Walker

CERTIFICATE OF SERVICE

I certify that this document is being filed through the Court's electronic filing system, which serves counsel for other parties who are registered participants as identified on the Notice of Electronic Filing (NEF). Any counsel for other parties who are not registered participants are being served by first class mail on the date of electronic filing.

/s/ Nathan R. Speed

Nathan R. Speed